Guideline G.02 – Fuel Modification Plans and Maintenance Standard

G.02.1 PURPOSE

The Newport Beach Fire Department, (NBFD) has applied vegetation management requirements for over 25 years. Fuel Modification guidelines, an alternative to traditional brush clearance practices, were established by the Wildland Urban Interface Task Force in July 1994. The purpose of these guidelines is to provide information on how fuel modification zones are to be designed, installed, and maintained in order to meet safety requirements. The many variables involved with fuel modification make precise regulations impractical.

G.02.2 SCOPE

All structures including any attachments to that structure located within designated Fuel Modification Zones shall comply with the requirements outlined in this document.

The requirements found in this guideline only apply to those sides of the structure that face the wildland area.

G.02.3 DEFINITIONS

CONDUCTION - Direct transfer of heat by objects touching each other.

CONVECTION HEAT - Transfer of heat by atmospheric currents, and is most critical under windy conditions and in steep terrain.

CROWN - Upper part of tree or other woody plant carrying the main branch system and foliage.

CANOPY - More or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees or other woody growth.

DEFENSIBLE SPACE - An area around the perimeter of structures or developments in the wildland which are key points of defense/attack against encroaching wildfires or escaping structure fires.

DRIPLINE - Ground area at the outside edge of the canopy.

DROUGHT TOLERANCE - The ability of a plant or tree to survive on little water.

FINE FUELS - Fuels such as grass, leaves, and draped pine needles which, when dry, ignite readily and are consumed rapidly (also called flash fuels).

FIRE BREAK - Removal of growth, usually in strips, around housing developments to prevent a fire from spreading to the structures from open land or vice versa.

FIRE RESISTANT - Any plant will burn with enough heat and proper conditions. Resistance is often used as a comparative term relating to the ability of a plant to resist ignition.

FIRE RESISTIVE PLANT LIST - List of plants exhibiting characteristics of low fuel volume, fire resistance, and drought tolerance which make them desirable for planting in areas of high fire danger. (List available on web page).

FIRE RETARDANCE - Relative comparison of plant species related to differences in fuel volume, inherent flammability characteristics, and ease of fire spread.

FUEL BREAK - A wide strip or block of land on which the native or pre-existing vegetation has been permanently modified so that fires burning into it can be more readily extinguished.

FUEL LOAD - The weight of fuels in a given area, usually expressed in tons per acre.

FUEL MODIFICATION ZONE - A strip of land where combustible native or ornamental vegetation has been modified and partially or totally replaced with drought tolerant, fire retardant, plants.

FUEL MOISTURE CONTENT - The amount of water in a fuel, expressed as a percentage of the oven dry weight of that fuel.

FUEL VOLUME - The amount of fuel in a plant in a given area of measurement. Generally an open-spaced plant will be low in volume.

HORIZONTAL CONTINUITY - The extent or horizontal distribution of fuels at various levels or planes.

LADDER FUELS - Fuels which provide vertical continuity between strata. Fire is able to carry from surface fuels by convection into the crowns with relative ease.

LITTER - The uppermost layer of loose debris composed of freshly fallen or slightly decomposed organic material such as dead sticks, branches, twigs, leaves or needles.

LONG TERM - In perpetuity of the fuel modification plan requirement.

PROBABILITY OF IGNITION - A rating of the probability that a firebrand (glowing or flaming) will cause a fire, providing it lands on receptive fuels. It is calculated from air temperature, fuel shading, and fuel moisture.

RADIANT HEAT - Transfer of heat by electromagnetic waves and can, therefore, travel against the wind. For example, it can preheat the opposite side of a burning slope in a steep canyon or a neighboring home to the ignition point.

SUBDIVISION - A parcel of land that is subdivided to create multiple individual lots for residential purposes in accordance with the State of California Subdivision Map Act.

TARGET SPECIES - Undesirable species that are generally removed as part of the fuel modification plan (see undesirable species).

URBAN INTERFACE - That line, area, or zone where structures and other human development meets or intermingles.

VERTICAL CONTINUITY - The proximity of fuels to each other that governs the fire's capability to sustain itself. Vertical continuity applies to the relationship of aerial fuels to surface fuels or fuels low to the ground.

SPECIAL FIRE PROTECTION AREA & VERY HIGH FIRE HAZARD SEVERITY ZONE - Any geographic area designated pursuant to Government Code Section 51178 to contain the type and condition of vegetation, topography, weather, and structure density due to increased possibility of conflagration fires. See Special Fire Protection Areas Guidelines and Very High Fire Hazard Severity Zones for Construction.

G.02.4 PROCEDURE

I. APPLICABILITY

A. A fuel modification zone is a wide strip of land where combustible vegetation has been removed and/or modified and partially or totally replaced with drought-tolerant, fire-resistant plants to provide an acceptable level of risk from wildland and vegetation fires.

II. REQUIREMENTS

A. Development occurring within fire hazard zones (e.g., foothills, mountains, non-irrigated former farming areas, and other lands containing combustible vegetation) requires modification of natural vegetation at the urban interface.

1. Fuel modifications vary in complexity and are dependent upon the amount and arrangement of vegetation, topography, degree of exposure, local weather conditions, construction, design, and placement of structures.
2. A typical fuel modification installation consists of a 20-foot setback zone (Zone A), a 50-foot minimum irrigated zone (Zone B), with an additional 100-foot minimum of vegetation thinning zones (Zones C and D).
3. The minimum width of a fuel modification area is normally 170 feet and in some cases the width increases due to type of terrain and/or type and mass of vegetation.

III. SUBMITTAL CRITERIA: CONCEPTUAL FUEL MODIFICATION PLANS

Conceptual fuel modification plans must be approved by the NBFD, concurrent with review and approval of any tentative map. This is usually in conjunction with the approval of an urban edge treatment plan by the jurisdiction building/planning department.

Conceptual fuel modification plans show the areas of fuel modification necessary to achieve an acceptable level of risk regarding exposure of structures to combustible vegetation.

Submit three (3) sets of plans, prepared by a licensed landscape architect or other design professional with equivalent credentials, to the NBFD for review.

The following shall be included on the conceptual fuel modification plan: (also, refer to Attachment 1):

1. Delineation of each zone (setback, irrigated, and thinning) with a general description of each zone's dimensions and character; i.e., 50' - 70' Zone B, with existing vegetation removed, irrigated, and planted with drought-tolerant and fire-resistant plant material (see The Fire Resistive Plant List available on web page).
2. Identify removal of undesirable plant species in accordance with the NBFD Combustible Plant Species List (see Combustible Plant list available on web page).

3. Existing vegetation impacted by the required fuel modification and, if available, proposed vegetation to be planted in the fuel modification area. The conceptual plans should be **sensitive to rare and endangered species. The design professional must be prepared to address their disposition in the final plans.**

4. Identify the design of the proposed development, showing all property lines, contour lines, and the proposed location of all structures nearest to the fuel modification area, if available.
5. Photographs of the area showing the type of vegetation that currently exists, including height and density, and the topography of the site.
6. Description of the methods to be used for vegetation removal, if appropriate; i.e., mechanical or manual.
7. Location of emergency and maintenance access easements every 500' of the fuel modification area. Access easements shall have a minimum 10' width; alternatively, 5' wide easements provided every 250' is acceptable. Gates shall be a minimum of 36" wide. The easements shall be maintained free of vegetation or any structures greater than 5" in height.
8. Identify what exists 300' beyond the development property lines in all directions; i.e., construction, natural vegetation, roads, parks, etc. (Note: the NBFD may require additional information on a project-specific basis.)
9. Identify all proposed off-site fuel modification areas and appropriate legal agreements with adjacent property owners.
10. A note stating plant species will be selected from the NBFD Approved Plant Palette.

Note: Approval of a fuel modification plan by the NBFD does not eliminate the requirement to obtain appropriate environmental, grading, and zoning clearance/permits.

IV. SUBMITTAL CRITERIA: PRECISE FUEL MODIFICATION PLANS

Precise fuel modification plans shall include all information required on conceptual fuel modification plans and the following additional information (also, refer to Attachment 1):

1. Location and detail of permanent zone markers (see Attachment 4).
2. Plant palette to be installed in accordance with acceptable guidelines.
3. Irrigation plans and specifications.
4. Building footprints or statement that clearly indicates the limits of proposed development.
5. All applicable maintenance requirements and assignment of responsibility (see Section XI).
6. Tract or project conditions, CC&R and/or deed restrictions relative to fuel modifications (see Attachment 5).

Additional information and details to be included on plans:

On large developments, fuel modification zones should be located within common lettered lots owned and maintained by associations representing common ownership; e.g., homeowners' associations. The integrity and longevity of the fuel modification zones shall be maintained with sufficient tract/project conditions and CC&Rs to specifically identify the restrictions within the fuel modification areas. Likewise, when fuel modification zones are located on private property, deed restrictions are required to specifically identify the restrictions on any portion of the property subject to fuel modification. (See Attachment 2)

A plant palette must be submitted containing both the botanical and common names of all plant materials that are to be used. In the irrigated zone areas (which commonly serve as a screening buffer between development and open space/park land), plants must be fire resistant and drought-tolerant. Plant materials used outside of the irrigated zones must be fire resistant. **Note: All plants shall be selected from the NBFD Fire Resistive Plan List and specified for appropriate fuel modification zones.**

Note: There is no such thing as a plant that will not burn. The term *fire resistant* may be misleading. All plants will burn given sufficient heat and low moisture content. Vegetative fire resistance may be enhanced through adequate irrigation or precipitation.

Devices that burn solid fuel are not permitted in any fuel modification zone.

V. ZONE A – SETBACK IRRIGATED ZONE (SEE ATTACHMENTS 2 & 3)

The purpose of the setback zone is to provide a defensible space for fire suppression forces and to protect structures from radiant heat and convective heat. **No combustible construction shall be allowed within the 20-foot setback zone (Zone A). In no case shall the A Zone be less than 20 feet minimum.** This zone is to be located on a level graded area at the top or base of slope and immediately adjacent to the protected development.

Zone A – Specific Requirements

- Automatic irrigation systems to maintain healthy vegetation with high moisture content.
- Irrigation maintained outside the drip line of native oak trees.
- Pruning of foliage to reduce fuel load, vertical continuity, and removal of plant litter and dead wood.

- Complete removal of combustible plant species (see Combustible Plant list available on web page), minimal allowance for retention of selected native vegetation.
- Plants in this zone shall be highly fire resistant and selected from the approved fire resistive plant list for the setback zone and given geological area (see Fire Resistive Plant List available on web page).
- Tree species are not allowed within 10 feet of combustible structures (measured from the edge of a full growth crown).
- Special consideration should be given for rare and endangered species, geologic hazards, tree ordinances, or other conflicting restrictions.
- Maintenance including ongoing removal and/or thinning of undesirable combustible vegetation, replacement of dead/dying fire resistant plantings, maintenance of the operations integrity and programming of the irrigation system, regular trimming to prevent ladder fuels.

VI. ZONE B – IRRIGATED ZONE

This portion of fuel modification consists of irrigated landscaping. The plans must delineate that portion of the fuel modification area that will be permanently irrigated. Plant material selection, irrigation system design, and the landscape maintenance management plan shall sensitively address water conservation practices and include methods of erosion control to protect against slope failure. All irrigation shall be kept a minimum of 20 feet from the drip line of any Quercus (oak) species. These irrigated zones are a minimum of 50 feet in width and may be increased as conditions warrant. Zone B shall be cleared of all combustible plant species, irrigated, and planted with plants from the approved NBFD Fire Resistive Plant List. Exceptions to save desirable species may be submitted for approval by the Fire Chief on a site-specific basis. As in Zone A, combustible construction is not allowed in Zone B.

Zone B – Specific Requirements

- With the exception of specimen native vegetation approved for retention, irrigated surface fuels shall be maintained at a height not to exceed 18 inches.
- Native grasses, when used, shall be cut after annual seeding. Heights shall not exceed 8 inches.
- Irrigation shall be designed to supplement native vegetation, and establish and maintain planted natives and ornamentals.
- Any plants selected for planting in this zone shall be selected from the fire resistive plant list for irrigated zones for a given geographical area (see Fire Resistive Plant List available on web page).
- Planting will be in accordance with planting guidelines and spacing standards established in this guideline (see Attachment 6).

- In Zones B, C, and D, sensitive and/or protected plant species shall be identified on the fuel modification plans and tagged in the field for further disposition.
- Trees and large tree-form shrubs (e.g., oaks, sumac, toyon) which are being retained with the approval of the agency having jurisdiction shall be pruned to provide clearance of **three times the height of the under story plant material or 10 feet, whichever is higher** (see Attachment 6). Dead and excessively twiggy growth shall also be removed.
- All existing plants or plant groupings except cacti, succulents, trees, and tree-form shrubs shall be separated by a distance of **three times the height of the plant material or 20 feet, whichever is greater** (see Attachment 6).
- Special consideration should be given for rare and endangered species, geological hazards, tree submitted for project approval, upon further review.
- Removal of undesirable plant species (see Combustible Plant List available on web page).

VII. ZONES C & D – THINNING ZONES – NON-IRRIGATED

Zone C is 50 feet in width and requires 50% thinning with removal of all dead and dying and undesirable species. Zone D is 50 feet in width and requires 30% thinning with removal of all dead and dying growth and undesirable species. Thinning zones are utilized to reduce the fuel load of a wildland area adjacent to urban developments, thereby reducing the radiant and convective heat of wildland fires. Thinning zones are located adjacent to the irrigated zone and can extend 100 feet or more into wildland areas. The percentage of vegetation to be removed is determined by many factors, including topography, exposure, and vegetation type and density. All dead and dying vegetation shall also be removed from the thinning zones. Additionally, undesirable plant species shall be removed from the thinning zones due to their susceptibility to wildland fire.

Zone C and D – Specific Requirements

- Removal of all dead and dying vegetation, all fine fuels reduced to a maximum of 8-12 inches in height.
- Native grasses, when used, shall be cut after annual seeding. Heights shall not exceed 8 inches.
- Any plants selected for planting in this zone will be chosen from the approved plant list for the setback, irrigated, or thinning zone for a given geographical area (see fire resistive plant list available on web page).
- Special consideration will be given for rare and endangered species, geologic hazards, tree ordinances, or other conflicting restrictions as identified in the environmental documents submitted for project approval review.

- Reduce fuel loading by reducing the fuel in each remaining shrub or tree without substantial decrease in the canopy cover or removal of tree holding root systems.
- In Zones B, C, and D, sensitive and/or protected plant species shall be identified on the fuel modification plans and tagged in the field for further disposition.
- Trees and large tree-form shrubs (e.g., oaks, sumac, toyon) which are being retained with the approval of the agency having jurisdiction shall be pruned to provide clearance of **three times the height of the under story plant material or 10 feet, whichever is higher** (see Appendix 6). Dead and excessively twiggy growth shall also be removed.
- All existing plants or plant groupings except cacti, succulents, trees, and tree-form shrubs shall be separated by a distance of **three times the height of the plant material or 20 feet, whichever is greater** (see Appendix 6).
- Maintain sufficient cover to prevent erosion without requiring planting.

VIII. ZONE E – INTERIOR/MANUFACTURED SLOPES

Zone E may or may not be applicable depending on the location and size of interior slopes. By definition, these slopes are planted and irrigated. However, the NBFD will make an interpretation based on topography, size, and plant palette as to whether improper maintenance could create a hazard to adjacent homes. If the potential for a hazard exists, the slopes shall be designated as fuel modification area Zone E. The intent is to ensure maintenance in accordance with Section XI and Attachment 5.

Zone E – Specific Requirements

- Designated as fuel modification for purposes of maintenance.
- Completely irrigated.
- Planted with approved Fire Resistive Plant materials in accordance with NBFD Fire Resistive Plant List (available on web page).
- Some planting restrictions may apply depending on location and size.

IX. OFF-SITE FUEL MODIFICATION REQUIREMENTS

Due to the variable and sometimes considerable amount of land necessary for fuel modification, development proposals often include a request to have the required fuel modification zones extend onto adjacent properties. However, off site fuel modification is not recommended due to problems inherent with enforcement of regulations on adjacent property and the potential for confusion regarding responsibility for fuel modification on areas outside of legal ownership. Proper on-site fuel modification design should determine where development can safely be located and should be an integral part of the development proposal.

Should off-site fuel modification be deemed a necessity, appropriate legally recorded instruments must be established that clearly state the responsibilities and rights of the parties involved relative to the establishment and maintenance of the fuel modification area. Appropriate recorded documents must include a recorded agreement between all parties and a grant of easement for the establishment and maintenance of the fuel modification area. It should be understood that the allowance of off-site fuel modification by an adjacent property owner may affect the rights and/or use of the off-site property. All agreements for any off-site fuel modifications shall be integrated into fuel modification plans with a letter from adjoining property owner giving rights to maintain fuels.

X. FUEL MODIFICATION PLAN REVISIONS

Revisions to previously approved fuel modification plans shall follow procedures as established by NBFD. Note: Revisions to plans will not be reviewed without a copy of the original stamped approved plan for reference.

XI. FUEL MODIFICATION IMPLEMENTATION & REQUIRED INSPECTIONS

(Note: This section shall be placed verbatim on precise fuel modification plans)

- **Prior to Building Permit Issuance:** The developer shall complete that portion of the approved fuel modification plan determined to be necessary by the NBFD prior to the introduction of any combustible materials into the area. This generally involves removal and thinning of plant materials indicated on the approved plan.

- **Prior to Issuance of Certification of Occupancy:** The fuel modification must be installed, completed, and inspected. This includes physical installation of features identified in the approved precise fuel modification plan (including, but not limited to, plant establishment, thinning, irrigation, zone markers, access easements, etc). An NBFD Fire Inspector will provide written approval of completion at the time of this final inspection.
- **Prior to Home Owner Association (HOA) Acceptance (if applicable):** This activity must include the NBFD Fire Inspector and the following representatives:
  - Landscape design professional
  - Installing landscape contractor
  - HOA management representative
  - HOA landscape maintenance contractor

The fuel modification shall be maintained as originally installed and approved. A copy of the approved plans must be provided to the HOA representatives at this time. Landscape professionals must convey ongoing maintenance requirements to HOA representatives.

- **Maintenance & Inspection:** The property owner is responsible for all maintenance of the fuel modification. All areas must be maintained in accordance with approved fuel modification plans. This generally includes a minimum of two growth reduction maintenance activities throughout the fuel modification areas each year (spring and fall). Other activities include maintenance of irrigation systems, replacement of dead or dying vegetation with approved materials, removal of dead plant material, and removal of undesirable species. The NBFD conducts regular inspections of established fuel modification areas. Ongoing maintenance shall be conducted *regardless* of the date of these inspections.

Attachment 1

FUEL MODIFICATION PLAN SUBMITTAL CHECKLIST

SUBMITTAL AND APPROVAL

	PRECISE PLANS
☐ Concurrent with review and approval of tentative map (if applicable)	
☐ Prior to issuance of grading permit (If no grading permit is required, prior to issuance of building permit)	X
☐ # of plans sets to the processing jurisdiction	3 sets

PLAN REQUIREMENTS

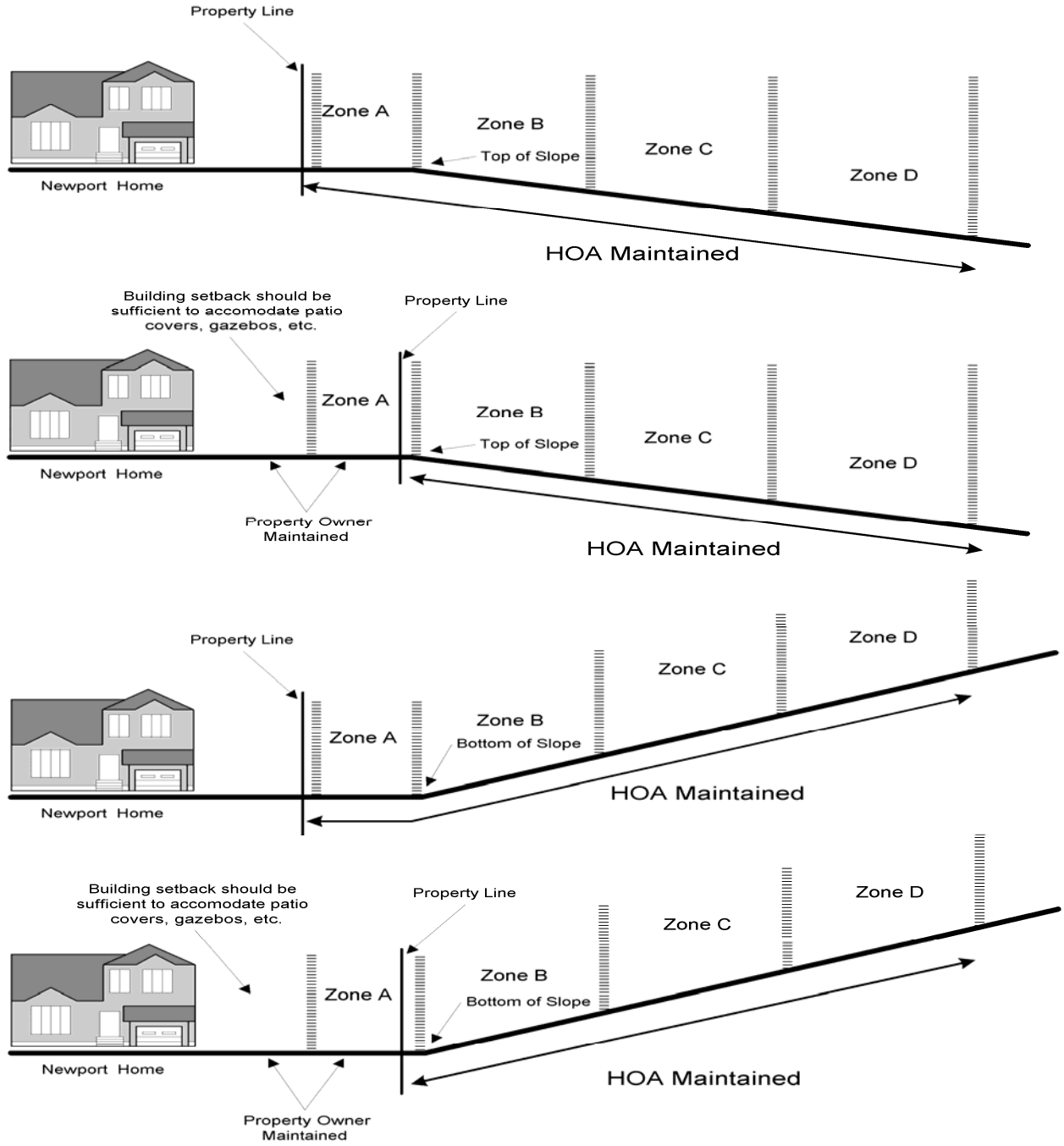
☐ Delineation of each fuel modification zone	X
☐ Scale Dimensions	X
☐ Site Characterization	X
☐ Photographs of area with emphasis on existing vegetation and topography	X
☐ Indication of permanent zone marker locations and detail	X
☐ Delineation of impacted existing vegetation	X
☐ Description of vegetation removal methodology	X
☐ Note indicating compliance with approved NBFD Fire Resistive Plant List	X
☐ Plant palette & specifications, including a plant legend (botanical & common names) for existing and proposed plants (1″ = 40′ min.)	X
☐ Designation of irrigated areas	X
☐ Irrigation plans and specifications (1″ = 40′ min.)	X
☐ Removal of combustible plant species	X

DELINEATION OF PROPOSED DEVELOPMENT:

☐ Property lines	X
☐ Contour lines	X
☐ Building lines or statement indicating limits of proposed development	X
☐ Emergency and maintenance access easements	X
☐ Description of existing improvements, land uses, & vegetation for 100′ beyond property lines in all directions	X
☐ Statement, on the plans, of ultimate maintenance responsibility requirement	X
☐ On title sheet, indicate tract/project conditions, CC&Rs, and/or deed restrictions relative to fuel modification areas	X
☐ Location of all proposed offsite fuel modification areas with easements	X

Attachment 2

FUEL MODIFICATION CONFIGURATION OPTIONS



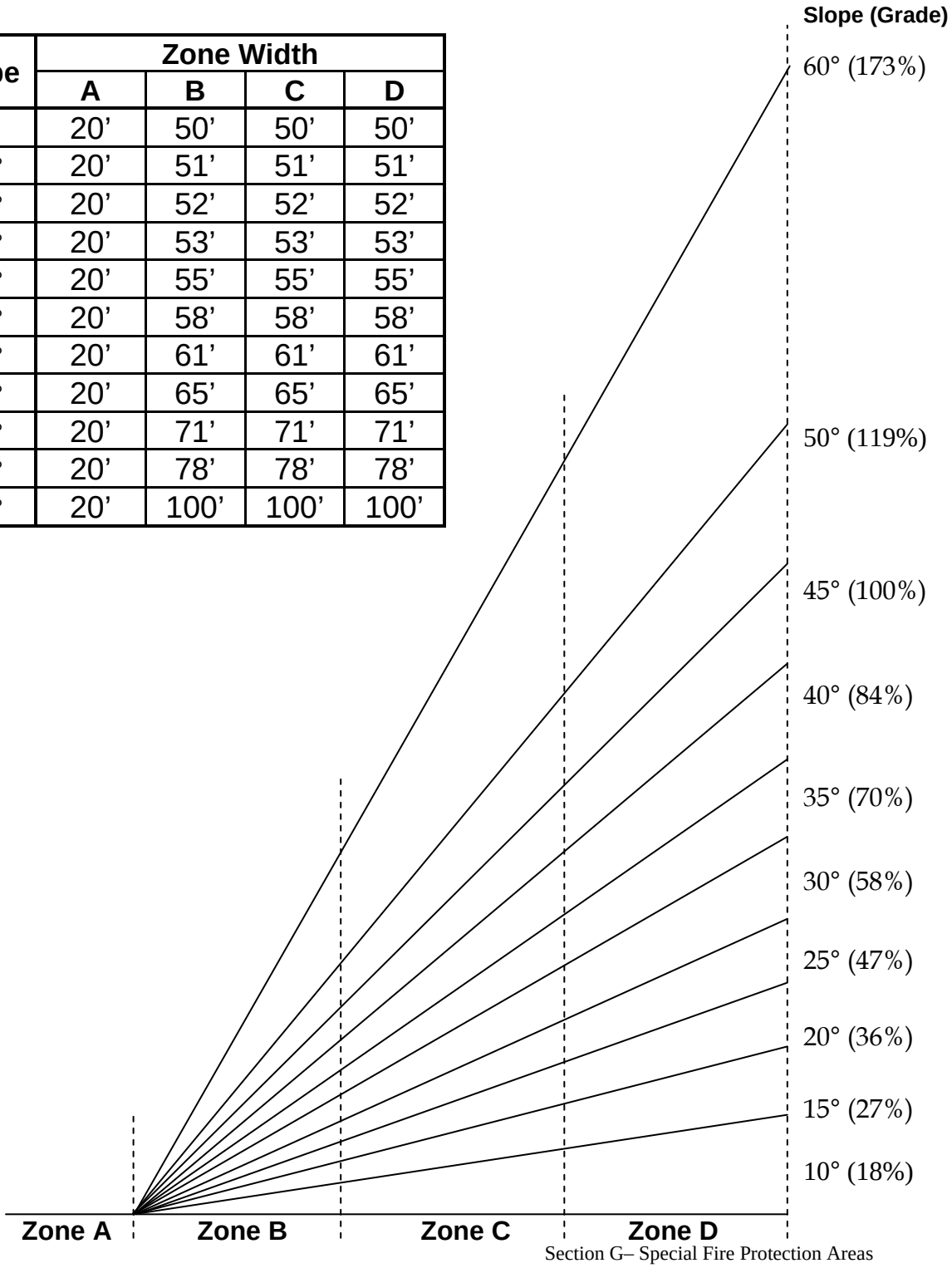
Note 1: The location of property lines will vary; however, if property lines must be located within fuel modification area, appropriate documentation (e.g., maintenance easements and/or deed restrictions) shall be established to: 1) restrict certain activities and uses on those portions of any private property within the fuel modification area, and 2) identify those responsible for the establishment and continued maintenance of the fuel modification area located on private property.

Note 2: Regardless of the entity responsible for fuel modification maintenance, the continued maintenance shall be in accordance with Section XI "Fuel Modification Implementation & Required Inspections" and other applicable sections of this Guideline.

Attachment 3

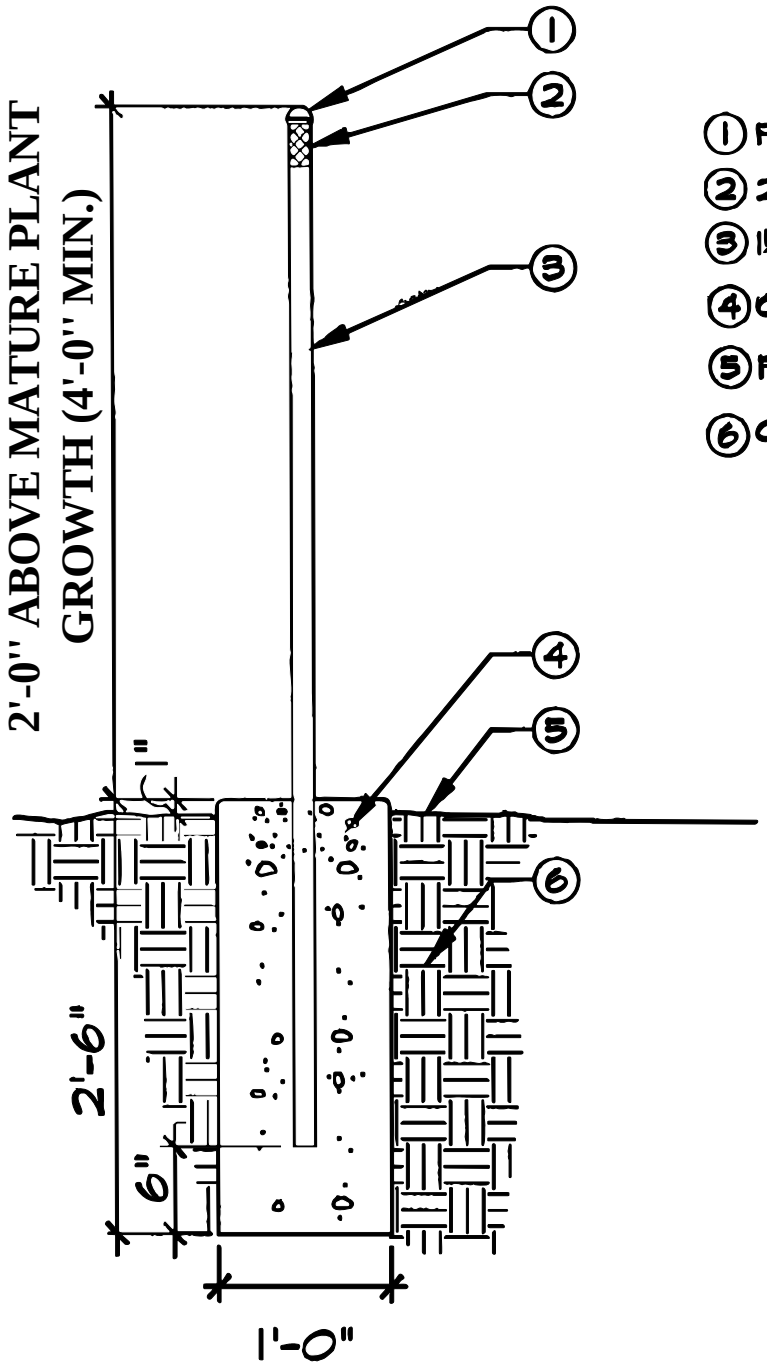
INCLINE MEASUREMENT FOR SELECTED SLOPES

Slope	Zone Width			
	A	B	C	D
0°	20’	50’	50’	50’
10°	20’	51’	51’	51’
15°	20’	52’	52’	52’
20°	20’	53’	53’	53’
25°	20’	55’	55’	55’
30°	20’	58’	58’	58’
35°	20’	61’	61’	61’
40°	20’	65’	65’	65’
45°	20’	71’	71’	71’
50°	20’	78’	78’	78’
60°	20’	100’	100’	100’



Attachment 4

ZONE MARKER DETAILS



Attachment 5

SAMPLE CC&R MAINTENANCE LANGUAGE

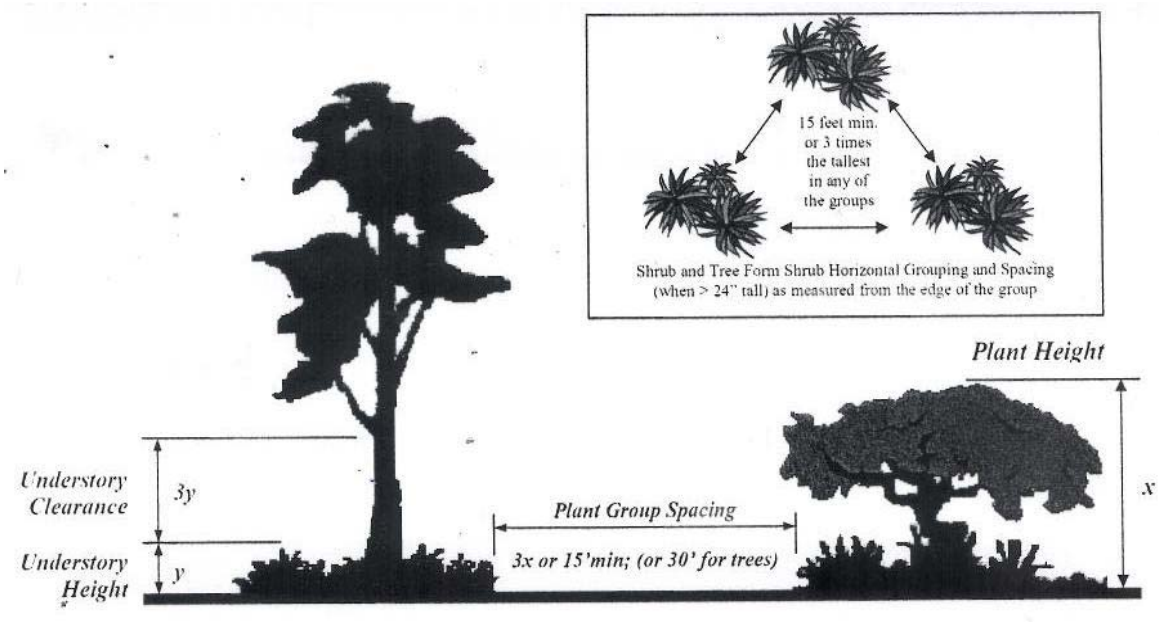
The following is a sample fuel modification maintenance condition intended to be inserted into CC&Rs:

> " _____ is responsible for maintaining, in accordance with any Newport Beach Fire Department requirements, those portions of the Covered Property identified as Fuel Modification Zones in Exhibit ___ and exhibits to any Supplemental Declarations. Construction or maintenance of structural improvements in Fuel Modification Zones, construction or maintenance of any combustible structural improvements on or adjacent to Fuel Modification Zones, and installation, maintenance, or modification of any landscaping improvements in Fuel Modification Zones that are inconsistent with any plant palette required by the Newport Beach Fire Department or the City of _____ are prohibited. All setback requirements with respect to the Fuel Modification Zones must be complied with."

Attachment 6

TREE AND SHRUB PRUNING AND SPACING

In Zones B, C, and D, sensitive and/or protected plant species shall be identified on the fuel modification plans and tagged in the field for further disposition. Trees and large tree-form shrubs (e.g., oak, sumac, toyon), which are being retained with the approval of the agency having jurisdiction, shall be pruned to provide clearance of three times the height of the understory plant material or 10 feet, whichever is higher (see figure below). Dead and excessively twiggy growth shall also be removed. Plant groupings specified in the NBFD "Fire Resistive Plant" must be spaced at a distance of at least three times the plant material height or 20 feet, whichever is greater (see figure below).



1. **Understory Clearance.** New and existing trees and tree form shrubs (naturally reaching 4' and taller), which are being retained with the approval of the fire department, shall be pruned to provide a clearance of 3 times the height of the understory plant material or 10 feet, whichever is greater (see figure above). New trees and tree form shrubs may comply with the lesser if sufficient height is not available to achieve 10 feet. Dead and excessively twiggy growth shall be removed.

2. **Plant Group Spacing.**
   a. Tree-form shrubs shall be single specimens or in a maximum grouping of three plants. Groupings shall be separated by a distance of three times the diameter of the largest individual mature crown or 15 feet, whichever is greater (see figure above).
   b. Trees shall be single specimen or in a maximum grouping of three. Groupings shall be separated by a distance of three times the diameter of the largest individual mature crown or 30 feet whichever is greater (see figure above).